CLAIMS

The embodiment of the invention in which an exclusive property or privilege is claimed is defined as follows:

1. A method for labeling nucleic acids, the method comprising:

a) contacting nucleic acid molecules with hydrogen peroxide and a redox-active coordination complex for a time and at concentrations sufficient to produce free-aldehyde moieties on the molecules;

b) reacting the aldehyde moieties with amine to produce a condensation product; and

c) labeling the condensation product.

2. The method as recited in claim 1 wherein the step of labeling the condensation product further comprises:

a) reducing the condensation product; and

b) contacting the reduced condensation product with a chromophore.

3. The method as recited in claim 1 wherein the nuclease is a coordi-

nation complex selected from the group consisting of 1,10-phenanthroline-CuII, bleomycin-Fe(III), EDTA-Fe, ascorbic acid-Cu, methylene-blue-Cu, metallophorphyrin, or combinations thereof.

4. The method as recited in claim 1 wherein the amine is a primary amine.

5. The method as recited in claim 1 wherein the amine is ethylene diamine or hydrazine or aminated biotin.

6. The method as recited in claim 1 wherein the contacting step occurs in an anaerobic environment.

7. The method as recited in claim 1 wherein the step of labeling the condensation product further comprises reducing the condensation product and cross-linking the reduced condensation product with a label in one reaction step.

8. The method as recited in claim 1 wherein the step of contacting the nucleic acid molecules with redox-active coordination complex includes contacting the nucleic acid with a denaturing agent.

9. A method for modifying nucleic acids, the method comprising:

a) contacting free radicals with the nucleic acids to produce free nucleic acid bases and aldehyde forms of ribose and deoxyribose;

b) contacting the aldehyde forms with an amine to produce a condensation product;

c) reducing the condensation product; and

d) labeling the reduced condensation product.

10. The method as recited in claim 9 wherein the step of producing free

radicals comprises reacting hydrogen peroxide with chemical nucleases.

11. The method as recited in claim 10 wherein the chemical nucleases are coordination complexes selected from the group consisting of 1,10-phenanthro-line-CuII, bleomycin-Fe(III), EDTA-Fe, ascorbic acid-Cu, methylene-blue-Cu, metallo-phorphyrin, or combinations thereof.

12. The method as recited in claim 9 wherein steps d and e occur simultaneously.

13. The method as recited in claim 9 wherein step e occurs in anaerobic conditions.

14. The method as recited in claim 9 wherein the nucleic acid is double stranded and wherein the step of contacting the free radicals with the nucleic acids is preceded by the addition of a double-strand weakening agent.

15. The method as recited in claim 14 wherein the double-strand weakening agent is a denaturing agent selected from the group consisting of carbonic acid, urea, ethyl carbonate, cyanamide, urethane, and combinations thereof.

16. The method as recited in claim 9 wherein the nucleic acid is modified at temperatures below the boiling point of water.

17. The method as recited in claim 9 wherein the nucleic acid modification occurs at between 0 °C and 95 °C.

18. The method as recited in claim 9 wherein the free radicals are contacted with the nucleic acids in an anaerobic atmosphere.